WEATHER, FORECASTS, AND WARNINGS FOR THE MONTH.

By EDWARD H. BOWIE, District Forecaster.

Unusual weather conditions during the month of May in the United States were the rule rather than the exception. The first week of the month was abnormally cool throughout the region east of the Rocky Mountains and warm over the Pacific slope; and frosts occurred at a number of points in the northern and central States from the western plains eastward. About the 10th of the month the above-referred-to temperature conditions were completely reversed and remained so until the close of the month; that is, the temperature was abnormally high and persistently so over practically all districts from the western plains to the Atlantic coast, and unseasonably low west of the Rocky Mountains. This condition was strikingly shown on a number of days when previous May records of heat were broken at points either in the Middle West or the Eastern States, and at the same time temperatures below the freezing point were recorded over the western Rocky Mountain Plateau. Also, it was not uncommon for the daily weather map to show warm-wave conditions in the Middle West at the time that snows were falling in the Rocky Mountains and the far Northwest.

While it is a recognized fact that warm waves in the Middle West and the Eastern States are closely related to a certain pressure distribution, namely, high barometric pressure over the middle latitudes of the Atlantic Ocean and low pressure in the Northwestern States and the interior of Alaska, it is seldom that this pressure distribution continues for a considerable length of time in the spring months. Usually it persists in May for short intervals of time only and the normal eastward movement of highs and lows along the northern border brings wide oscillations of temperature over much of the country. In the month under discussion there were few highs from the Northwest, and with two or three exceptions, hereinafter referred to, the lows were deflected far to the north of their normal course and the regions of intense heat did not come within the zone of the cyclonic winds. Moreover, when temperatures are persistently above the normal east of the Rocky Mountains it is usual for cool weather to prevail over the Pacific slope. The explanation is that the pressure being abnormally low over the Northwestern States there is necessarily a general flow of air from the high off the Pacific coast over this region and therefore low temperatures prevail. The international daily weather maps for the Northern Hemisphere for May show but minor oscillations in the so-called permanent highs over the middle latitudes of the Atlantic and Pacific Oceans, and for the greater part of the month the barometric readings reported from these regions were near or above the normal; also, the low over the Aleutian Islands and Alaska was deeper than normal but without marked pressure changes, and it did not give way until the last decade of the month. It is interesting to note that the cool weather of the first week of the month followed the building of an area of high barometric pressure over Alaska during the last decade in April, and that the general break in the intense heat in the Middle West and the Eastern States at the close of the month of May similarly followed an unusual increase in barometric pressure in that region. The so-called permanent low in the region of Iceland was absent from the 9th to the 20th and after the 26th; it was well defined from the 1st to the 8th and from the 21st to the 25th. Over the British Isles the barometer was low from the 1st to the 4th, 10th to 18th, and again on the 25th, well-defined depressions appearing on the 3d, 14th, and 25th; at other times during the month pressure readings were above the normal. Low pressure prevailed over southern and high pressure persisted the greater part of the month over northern Europe. There were strong variations in pressure over the interior of Asia the first half of the month; during the latter half the pressure oscillations in that region were unimportant though frequent.

On April 30 the following forecast for the first week in May was issued:

A cool wave now over the Northwest will move southeastward, reaching the Missouri, the lower Arkansas, and the upper Mississippi Valleys and the western upper Lake region on Monday; the Ohio Valley, the upper Lake and the lower Lake regions by Tuesday, and the Middle Atlantic States and New England about the middle of the week. Temperatures will reach the freezing point by Monday morning over the central Rocky Mountain region and the Northwest, and will be near freezing in Kansas, the Missouri and extreme upper Mississippi Valleys, and the western upper Lake region.

During the first half of the week the weather will be unsettled and showery over the eastern portion of the country, followed by a return to more settled conditions during the second half. In the great central valleys and the upper Lake region rains Monday and Tuesday; probably some snow over the northern districts; will be followed by clearing weather by the middle of the week and a return to more seasonable conditions. In the Plains States the weather will be generally fair after Monday, and the temperatures will begin to rise after Tuesday with the approach of a barometric depression from the Canadian Northwest. In the South the weather will continue more or less unsettled with occasional showers.

A barometric depression of marked intensity was central at 8 a. m. of the 1st over Lake Michigan, whence it moved rapidly east-northeastward and reached the Canadian maritime Provinces the night of the 2d. This disturbance caused shifting gales and rain and snow in the region of the Great Lakes and the Upper Mississippi and Missouri Valleys and strong westerly winds on the Atlantic coast from Cape Hatteras to Cape Cod. Storm warnings were displayed well in advance of the occurrence of these winds, and so far as is known there were no wrecks of vessels in the zone of high winds. At Green Bay, Wis., the wind reached a velocity of 68 miles an hour and winds of lesser violence were recorded at a number of points on the Great Lakes on the 1st and 2d, while the highest velocity reported from the Atlantic coast was 48 miles an hour at New York on the 2d. This disturbance caused numerous thunderstorms in the eastern half of the country and it was followed by unseasonably cool weather, frosts occurring the first several days of the month over nearly all northern and central States from the Plains States to the Middle Atlantic and New England coasts. Warnings of these frosts were issued well in advance of their occurrence.

On the 2d the pressure fell rapidly along the North Pacific coast, and a well-defined depression appeared in that region on the night of the 2d, causing brisk and high winds, and rains in Washington, Oregon, and Idaho. Storm warnings were displayed on the North Pacific coast the morning of the 2d. This disturbance rapidly lost intensity while crossing the Rocky Mountains.

The weekly forecast of Sunday, the 7th, read as follows:

The general pressure distribution over the Northern Hemisphere is such as to indicate that the coming week will be one of seasonably high temperatures in practically all districts east of the Rocky Mountains and relatively low temperatures over the western Plateau region and the Pacific States. There are no indications of a general storm to cross the country during the coming week, and the rainfall of the next

several days will be light and local and confined principally to the Middle West and the North Pacific States.

During this week the temperature averaged much above the normal in the region east of the Rocky Mountains and considerably below the normal over the Pacific States and the western Plateau. A disturbance of moderate intensity moved to the upper Missouri Valley on the 9th from the Canadian northwest, and passed thence northeastward across the Great Lakes on the 11th and down the St. Lawrence Valley on the 13th; it was attended by scattered thunder showers and moderately high winds on the Great Lakes, warnings of which were displayed 12 hours or more in advance of their occurrence. This depression was preceded by high temperatures for the season throughout the Middle West and the Eastern States, and at a number of points new records of high temperature for the season were established.

The weekly forecast of Sunday, the 14th, follows:

The indications are that the coming week will give temperatures averaging near or slightly below the normal in Northern and Central States east of the Rocky Mountains and in the North Pacific States. Relatively high temperatures will prevail in the Southern States and on the southern Pacific slope. The week will be one of generally fair weather west of the Rocky Mountains and in the Southwest. A disturbance that now covers the Rocky Mountains and the western Plateau will advance slowly eastward, preceded by rising temperature, unsettled weather, and fairly well-distributed rainfall; it will cross the Middle West Tuesday or Wednesday and reach the Atlantic States Thursday or Friday; it will be followed by fair and cooler weather over the Central and Northern States east of the Rocky Mountains.

The weather conditions during the week covered in the forecast immediately preceding were as forecast, with the exception that the warm-weather forecast for the Southern States also prevailed in the Lake region, the upper Mississippi Valley, and the Northeastern States. The precipitation attending the disturbance referred to afforded much needed relief from droughty conditions over the Middle West and the Southern States, except on the Atlantic coast. Frosts and local snows occurred the latter part of the week in the northern Rocky Mountain and Plateau regions.

A marked depression appeared off the north Pacific coast on the 17th and caused high winds; it passed inland and lost intensity while crossing the Rocky Mountains.

This disturbance was of unusual intensity for the season along the coast, a wind velocity of 76 miles an hour occurring at North Head, Wash., on the 17th.

With reference to the storm warnings issued in advance of the occurrence of these winds, the Journal (Portland, Oreg.) of the 18th remarked:

Exceptionally good work was done by the local Weather Bureau, and they had storm warnings up at 7.30 o'clock in the morning of the 17th, although the full force of the blow, which came suddenly, was not felt until late in the afternoon. But for the timeliness of the warnings it is said that shipping would probably have suffered because of the fact that a storm of that character is of such unusual occurrence so late in the season.

The weekly forecast of Sunday, the 21st, follows:

A barometric depression that is now over the Mississippi Valley will advance slowly eastward, attended by unsettled weather and showers Monday in the region east of the Mississippi River and on Tuesday and probably Wednesday in the Eastern States. Aside from the precipitation caused by this disturbance, the week will be one of generally fair weather. Cooler weather will overspread the Eastern States during the first part of the week, and will be followed by a period of moderate temperatures. Moderate temperatures will continue throughout the week in the Middle West and the Southern States, while relatively high temperatures are indicated for the next several days west of the Rocky Mountains.

The barometric depression referred to in this forecast moved eastward as stated and caused showers in the Ohio and Mississippi Valleys, the Lake region, and the middle Gulf States Monday, and the Eastern States on the 24th and the 25th. Beginning on the 23d, there were light local rains and snows in the Rocky Mountains and Plateau region, and later rains fell in the middle Plains States, being heavy in Kansas, Oklahoma, and northwest Texas. A change to cooler weather overspread the Eastern States on the 23d and 24th, while over the Middle West moderate temperatures were succeeded by a period of abnormally high temperatures on the 25th to 28th, when the maximum readings exceeded or equaled previously recorded high temperatures in the latter half of May at many stations in the Mississippi Valley. During the period of intense heat in the central valleys, unusually cold weather for the season prevailed over the region west of the Rocky Mountains; frost and freezing temperature occurring over large areas in the Plateau region. This area of cool weather advanced eastward and overspread nearly all districts east of the Rocky Mountains at the close of the week.

The forecast for the week beginning May 29 follows:

The general distribution of barometric pressure over the North American Continent and the adjacent oceans is such as to indicate that the coming week will be one of moderate temperature throughout the country, preceded, however, in the Eastern States by moderately high temperatures Monday and Tuesday. Conditions are favorable for unsettled weather and showers the first part of the week in the Gulf States, the lower Ohio and middle Mississippi Valleys, and the middle Plains States, and it is probable that this area of unsettled weather and showers will advance northward and eastward over the upper Mississippi Valley, the Lake region, and the Eastern States during the latter part of the week. Generally fair weather is indicated for the region west of the Rocky Mountains during the coming week.

The weather during the remaining days in May occurred as forecast on the 28th instant. A disturbance appeared in the Northwest on the 28th, crossed the northern Plains States on the 30th, the Great Lakes on the 31st, and thence moved down the St. Lawrence Valley. It gave general precipitation the first part of the week in the middle West and the latter part in the Eastern States; it was attended by numerous severe thunderstorms from the Mississippi Valley to the Atlantic coast. On the morning of the 31st warnings of severe local squalls were issued for the lower Lakes. On the afternoon of this day severe wind squalls caused the loss of several lives on Lake Erie. The wind reached a velocity of 60 miles an hour at Cleveland, Ohio. This disturbance was followed by moderate temperatures throughout the country, except in the west Gulf States, where intensely warm weather prevailed until the close of the month.

Average temperature and departure from the normal, May, 1911.

Districts.	Number of stations.	Average temperatures for the current month.	Departures, current month.	Accumulated since Jan. 1.	Average since Jan. 1.
New England	12	58.7	+4.2	+ 1.9	+0.4
Middle Atlantic	15	66.2	+4.7	+ 4.9	+1.0
South Atlantic	10	70.9	+1.1	+ 9.0	+1.8
Florida Peninsula *	7	75.0	− .9	+10.6	+2.1
East Gulf	11	73.7	+1.4	+17.7	+3.5
West Gulf	10	72.9	+ .3	+18.7	+3.7
Ohio Valley and Tennessee	13	69.8	+4.5	+14.5	+2.9
Lower Lakes	10	63.5	+6.3	+10.9	+2.2
Upper Lakes	12	57.6	+5.4	+17.3	+5.5
North Dakota *	9	55.1	+1.6	+ 4.4	+ .9
Upper Mississippi Valley	14	67.3	+5.4	+18.3	+3.7
Missouri Valley	12	65.2	+3.2	+20.8	+4.2
Northern slope	9	52.8	− .2	+ 6.6	+1.3
Middle slope	6	64.9	+3.0	+17.8	+3.6
Southern slope *	8	70.9	+1.4	+18.0	+3.6
Southern Plateau *	10	65.0	−1.8	+ 3.6	+ .7
Middle Plateau *	10	54.0	−1.2	+ 5.1	+1.0
Northern Plateau *	11	51.8	−3.2	− 2.7	− .5
North Pacific	7	50.9	−2.3	− 7.1	−1.4
Middle Pacific	5	56.9	−2.6	− 5.4	−1.1
South Pacific	4	60.1	−1.6	+ .5	+ .1

Regular Weather Bureau and selected cooperative stations.

Average precipitation and departure from the normal, May, 1911.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
New England	11	1.04	31	−2.3	− 4.3
Middle Atlantic	15	1.42	40	−2.1	− 6.2
South Atlantic	11	1.17	31	−2.6	−10.7
Florida Peninsula*	7	4.06	128	+ .9	− 6.1
East Gulf	11	2.69	77	− .8	− 4.3
West Gulf	10	1.56	38	−2.6	− 3.6
Ohio Valley and Tennessee	13	1.34	37	−2.3	− 2.3
Lower Lakes	10	2.00	65	−1.1	− 1.5
Upper Lakes	12	3.87	115	+ .5	− .7
North Dakota*	9	3.08	125	+ .6	+ .5
Upper Mississippi Valley	15	2.47	59	−1.7	− 2.8
Missouri Valley	12	1.90	45	−2.3	− 2.4
Northern slope	9	1.21	52	−1.1	− 1.8
Middle slope	6	2.54	68	−1.2	− 2.0
Southern slope*	8	2.51	57	−1.9	− 1.3
Southern Plateau*	10	.15	33	− .3	+ .7
Middle Plateau*	11	.38	32	− .8	− .1
Northern Plateau*	11	2.02	111	+ .2	− 2.1
North Pacific	7	3.38	131	+ .8	+ 8.9
Middle Pacific	7	.87	69	− .4	+ 3.7
South Pacific	4	.08	14	− .5	− 7.4

* Regular Weather Bureau and selected cooperative stations.

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	73	−5	Missouri Valley	61	−4
Middle Atlantic	66	−6	Northern slope	62	+4
South Atlantic	70	−4	Middle slope	56	−5
Florida Peninsula	76	0	Southern slope	59	−2
East Gulf	65	−6	Southern Plateau	32	0
West Gulf	66	−9	Middle Plateau	41	−5
Ohio Valley and Tennessee	60	−8	Northern Plateau	57	+1
Lower Lakes	64	−8	North Pacific	78	+2
Upper Lakes	69	−3	Middle Pacific	70	−1
North Dakota	66	+4	South Pacific	68	−1
Upper Mississippi Valley	60	−8			

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	5.1	−0.4	Missouri Valley	4.5	−0.6
Middle Atlantic	4.0	−1.0	Northern slope	5.4	− .1
South Atlantic	3.8	− .7	Middle slope	4.9	.0
Florida Peninsula	4.2	− .2	Southern slope	4.6	+ .2
East Gulf	3.3	−1.4	Southern Plateau	2.2	− .5
West Gulf	3.6	−1.2	Middle Plateau	4.5	+ .4
Ohio Valley and Tennessee	3.5	−1.5	Northern Plateau	6.0	+ .9
Lower Lakes	3.7	−1.7	North Pacific	6.9	+ .6
Upper Lakes	5.0	− .5	Middle Pacific	4.3	+ .3
North Dakota	5.1	− .4	South Pacific	3.6	+ .5
Upper Mississippi Valley	4.4	− .9			

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Buffalo, N. Y.	1	56	sw.	North Head, Wash.	2	54	se.
Canton, N. Y.	2	54	sw.	Do.	3	76	se.
Cleveland, Ohio	31	60	nw.	Do.	4	64	se.
Columbus, Ohio	1	52	w.	Do.	17	78	se.
Detroit, Mich.	1	56	w.	Pittsburg, Pa.	31	57	nw.
Duluth, Minn.	11	54	sw.	Point Reyes Light, Cal.	4	51	nw.
Fort Smith, Ark.	20	52	nw.	Do.	6	53	nw.
Green Bay, Wis.	1	68	n.	Do.	8	53	nw.
Helena, Mont.	6	58	sw.	Do.	9	53	nw.
Lewiston, Idaho	5	54	w.	Do.	11	50	nw.
Marquette, Mich.	18	50	s.	Do.	12	80	nw.
Modena, Utah	5	52	sw.	Do.	13	70	nw.
Do.	23	52	sw.	Do.	14	61	nw.
Mount Tamalpais, Cal.	5	52	nw.	Do.	15	50	nw.
Do.	6	50	nw.	Do.	18	63	nw.
Do.	8	56	nw.	Do.	23	53	nw.
Do.	9	72	nw.	Do.	24	65	nw.
Do.	12	78	nw.	Do.	25	64	nw.
Do.	13	65	nw.	Do.	26	54	nw.
Do.	23	54	w.	S. E. Farallon, Cal.	13	51	nw.
Do.	24	60	nw.	Tatoosh Island, Wash	2	52	s.
Do.	25	61	nw.	Do.	3	68	s.
Mount Weather, Va.	2	56	nw.	Do.	4	52	s.
New York, N. Y.	2	55	nw.	Toledo, Ohio	1	56	sw.
Do.	3	50	nw.				